

# The zooplankton of Zeekoevlei and Princess Vlei (Western Cape) - A preliminary assessment

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## Abstract

This paper provides a 3-year record of the zooplankton composition and seasonally in Zeekoevlei and Princess Vlei, 2 coastal lakes situated on the Cape Flats of the Cape Peninsula, South Africa. Zeekoevlei (256 ha) is a poorly flushed, shallow hyper-eutrophic lake dominated year-round by cyanophyte algal species with underlying diatom and chlorophyte assemblages. Princess Vlei is smaller (35 ha), shallow and eutrophic with significant hydraulic flushing during winter resulting in a clear water phase. The zooplankton composition and relative abundance in Zeekoevlei and Princess Vlei were similar. In both lakes copepods contributed most to the total zooplankton standing stock. In Princess Vlei this was enhanced by the presence of the calanoid copepods *Metadiaptomus purceilli* and *Lovenula simplex* during the winter clear water phase. Cladocerans were poorly represented and present in low numbers in both lakes. It appears that the abundance of zooplankton in Zeekoevlei is controlled by factors other than phytoplankton resource availability. In Princess Vlei low algal densities during the winter clear water phase appear to be advantageous to filter-feeders such as *Daphnia* spp. as well as calanoid copepods.

## Introduction

Very few South African coastal lakes have been studied extensively with special reference to zooplankton. Investigations have been conducted in Natal in the estuarine or semi-estuarine systems of Lake Sibaya (Hart, 1981) and Lake Mzingazi (Fowles and Archibald, 1987), in the southern Cape on the Wilderness Lakes complex (Coetzee, 1980; 1981 and 1983) and recently, Lake Cubhvi in Zululand (Martin and Cyrus, 1994). Sparse data exist on the zooplankton of the principal coastal lakes of the Cape Peninsula Zeekoevlei, Princess Vlei and Zandvlei (Hutchinson et al., 1932; Harrison, 1962 and Van Wyk, 1970).

This report describes the zooplankton composition and relative abundance during the period October 1989 to December 1992 of Zeekoevlei and Princess Vlei with the aim of establishing baseline data for comparison with future changes in the zooplankton community structure in these 2 lakes.

## Study area

Zeekoevlei (34°S 18°30'E) is a 256 ha, shallow (mean depth 1.9 m) perennial, freshwater coastal lake situated 20 km south of Cape Town on the Cape Flats of the Cape Peninsula (Fig. 1). The lake is hyper-eutrophic as a result of high concentrations of nitrogen and phosphorus (Table 1) introduced via catchment runoff, and internal phosphorus loading from the considerable sediment accumulations (Harding, 1992b). Zeekoevlei exhibits the effects of excessive nutrient enrichment and is dominated year-round by the cyanophyte alga *Microcystis aeruginosa* (Harding, 1992b).

Princess Vlei (34°S 18°30'E) is a small (35 ha), shallow (mean depth 2.4 m), permanent freshwater coastal lake (as defined by Davies and Day, 1986) situated approximately 2 km NW of Zeekoevlei (Fig. 1). Princess Vlei is fed by the Southfield Canal and drains an urban catchment of approximately 800 ha and has been described as eutrophic (Table 2) (Harding, 1992a).

## Materials and methods

Physical and chemical water sampling was previously conducted on a fortnightly basis at each lake. These results, including the phytoplankton composition and periodicity of Zeekoevlei and Princess Vlei, have been described in detail by Harding (1992a; 1992b).

Zooplankton samples were collected fortnightly from October 1989 from Station 3 of both lakes (Fig. 1). A 3/Van Dorn sampler was lowered vertically into the water to collect subsurface samples which were then filtered through a 60 µm Nitex screen to retain small crustacean as well as rotifer species. The samples were preserved following the method of Haney and Hall (1973) for later taxonomic identification and enumeration (sub-sampled using the method of Allanson and Kerrich, 1960 using a Zeiss low-power binocular microscope. No distinction was made between copepod larval stages and larval stages were simply counted as nauplii. The results were reported as number of individuals l<sup>-1</sup>.

Three additional zooplankton samples were collected from the same site between May 1990 and July 1991 in order to estimate the total zooplankton community biomass. These samples were preserved in 4% formalin and stored overnight at 4°C. This allowed the buoyant algal species to float to the surface of the sample where they could be removed without disturbing the settled zooplankton. Each of the zooplankton samples was then filtered onto a preweighed 60 µm Nitex filter and dried at 105°C for 24 h. A mean value was calculated in order to obtain the zooplankton community biomass as mg l<sup>-1</sup> dry mass.

Between July 1991 and August 1992 the Van Dorn sampler was replaced with a zooplankton collecting net with a mouth opening of 300 mm and mesh aperture of 74 µm, with the intention of collecting a series of qualitative samples ensuring that no zooplankton species were missed due to the small sample volume (3l) of the Van Dorn Bottle. The net was towed horizontally alongside the boat for a distance of 4.2 m, and the samples treated in the same manner as described previously. These results, calculated as per m<sup>-3</sup>, were converted to number of individuals l<sup>-1</sup> and biomass to mg l<sup>-1</sup> dry mass. The dense cyanobacterial populations in both lakes, however, caused clogging of the sampling net and consequently the Van Dorn sampling bottle technique was resumed.

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